Presentation to the United States Human Space Flight Plans Review Committee

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Mission

- **Committee Charter:**
  - **Objective: independent review of ongoing U.S. human space flight plans and programs to ensure a trajectory that is "safe, innovative, affordable, and sustainable"**
  - **Including examination of "appropriate opportunities for international collaboration"**
- **The International Space Station is a cornerstone in the architecture of human exploration of space**
- **With the Ariane 5 and Automated Transfer Vehicle (ATV), Arianespace provides cargo services to the ISS through appropriate international collaboration in support of NASA's human space flight activities**

Baseline for ISS Utilization

- Support for six-person crew aboard the completed ISS
- Fully utilize ISS for biological and scientific research
- Shuttle retirement in 2010 drastically diminishes U.S. up-mass/return capability until CRS suppliers come on-line
- CRS has four independent parts = two launch vehicles and two cargo systems which must be operational by 2011
- NASA CRS requirements call for 20 missions carrying over 41 metric tons of cargo to ISS between 2010 and 2015
- NASA is likely to need gap-filler commercial cargo service by 2013 should any of the four systems be delayed
- Likely shortfall of 3-12 metric tons per year 2010-2015

Arianespace Heritage

- **Since 1980, Arianespace has placed space at the center of everyday life:**
  - **Space for Science: understanding the Universe**
  - **Space for Earth: monitoring the environment**
  - **Space for Security: delivering information**
  - **Space for Communications: connecting the world**

- **Arianespace is a European company:**
  - **23 Shareholders from 10 European countries**
  - **Arrangement with the European Space Agency (ESA)**

- **270 Payloads launched to date**
  - **74 customers worldwide**
  - **Serving 8 national and international space agencies**
  - **More than 50% of operational commercial satellites**

Service & Solutions

- From contract signature to in orbit delivery, Arianespace is committed to:
  - Provide financing, insurance and schedule assurance
  - Procure launchers from industrial manufacturers
  - Monitor quality
  - Perform the mission:
    - Mission analyses and interface validation
    - Satellite, launcher and combined operations
    - Launch facilities and launch operations

- Arianespace has the largest order book in the industry
  - 31 customers
  - 35 GTO satellites to launch
  - 7 Ariane 5 institutional launches (6 ATVs)

Ariane 5

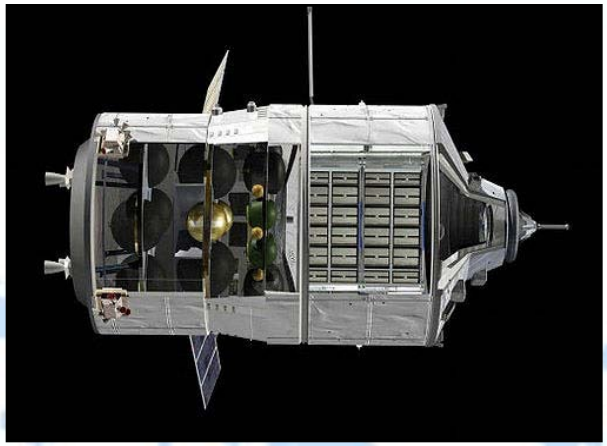
- **The most reliable heavy-lift launcher:**
  - **45 launches overall**
  - **31 successes in a row since 2003**
- **Capability:**
  - **20 metric tons to Low Earth Orbit**
  - **7 metric tons to Lunar Transfer Orbit**
  - **5 metric tons to Mars**
- **Unmatched launch tempo:**
  - **7 launches per year**
  - **46 launch vehicles currently in production**
  - **2 launch tables = surge capability and reactivity**
  - **4 Ariane 5s launched in 4 months and 10 days**
  - **9 Ariane 5s (17 payloads) launched 08/2007 – 08/2008**

ATV Jules Verne
Facts & Figures

- ATV Jules Verne mass = 19,400 kg (including adapter)
  - Height = 10.8 meters utilizing a long fairing
  - Diameter = 4.5 meters
  - 7,700 kg dry mass
  - 840 kg water and 100 kg air
  - 4,700 kg propellant for ISS re-boost
  - 6,400 kg disposal mass
  - ~ 3 times the capability of a Progress
- Employed a newly developed Vehicle Equipment Bay (VEB) carbon fiber structure to support the mass
- Duration of the mission to separation = 1 hour and 6 minutes
- ATV orbit at separation = circularized at 260 km, inclined at 51.6° (compared to normal GTO 250 x 36,000 km, 6°)

ATV Jules Verne
Mission Overview

- ATV Jules Verne arrived at Guiana Space Center August 2007
- Launched on March 9, 2008
- Docked to ISS on April 3
- Re-boost firings on April 25 and June 20
- Undocked from ISS on September 5
- Re-entered atmosphere on September 29



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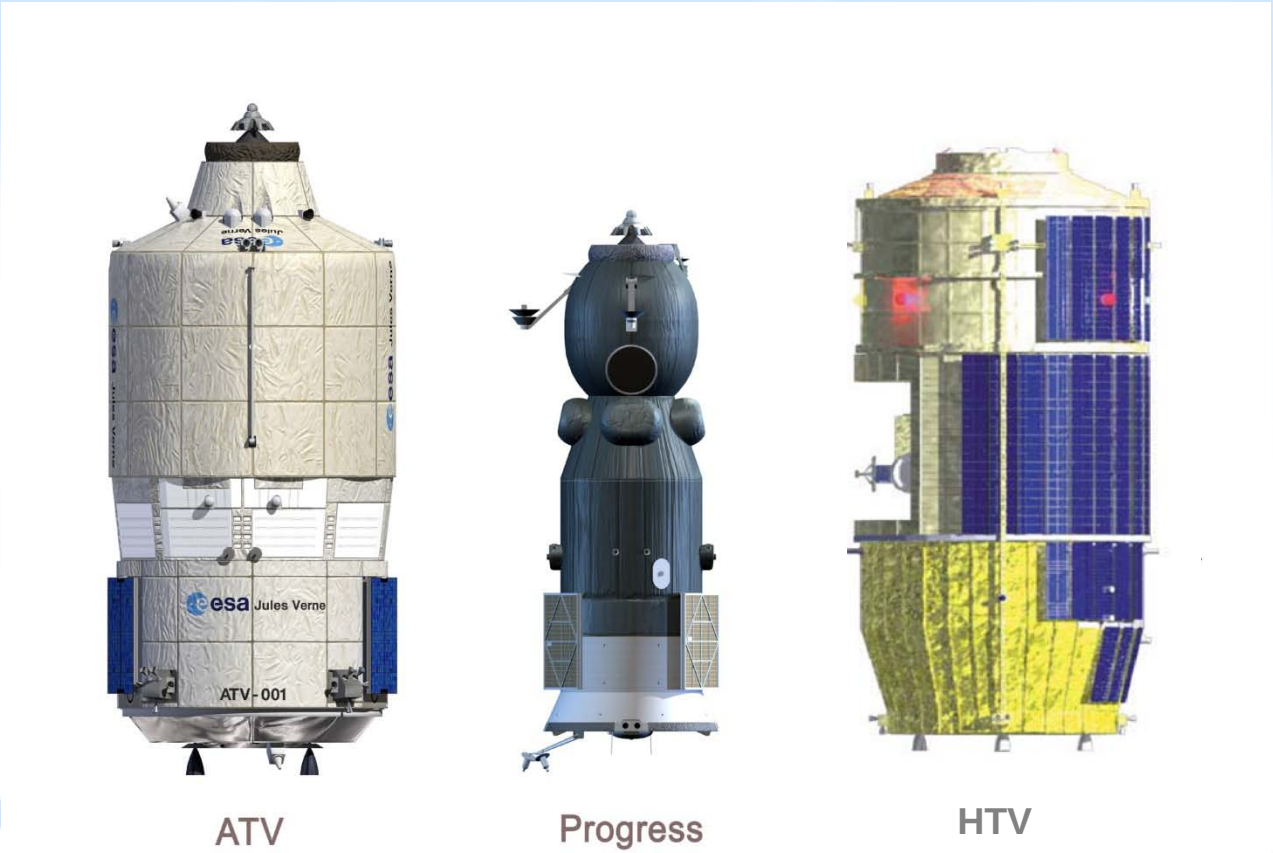
ATV Jules Verne

Capacity Comparison

ATV - Progress - HTV

	ATV	Progress	HTV
Lift-off Mass	20,750 kg	7,150 kg	16,500 kg
Cargo Mass	7,750 kg	3,200 kg	6,000 kg



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International Cooperation

- Launches performed from the Guiana Space Center
  - Modern ESA facilities meeting western safety standards
  - NATO territory: security at same level as nuclear forces
- Long history of cooperative efforts with NASA
  - Topex/Poseidon oceanography satellite
  - Jason-1 (Topex/Poseidon follow-on)
  - Calipso
- James Webb Space Telescope (NASA/ESA)
  - Heritage from Rosetta, Herschel-Planck
- 24 national security missions for 5 NATO nations with 100% success:
  - Skynet (UK)
  - Optus & Defence (Australia)
  - Syracuse/Helios (France)
  - Hispasat/Spainsat/Xtar (Spain)
  - Eurasiasat (Turkey)
  - Sicral (Italy)

Conclusion

- **Ariane 5 - ATV cargo resupply can provide gap-filler services until CRS providers fully meet NASA requirements**
- **Sustains architecture for future U.S. human space flight providing utilization of the completed ISS**
- **Ariane 5 - ATV is a flight proven system meeting NASA's ISS cargo resupply requirements**
- **Opportunity for international collaboration using a successfully demonstrated capability**

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